

ENTOMOLOGY.—*New species of Helicopsyche from the Western Hemisphere*¹ (Trichoptera, Helicopsychidae). H. H. Ross, Illinois Natural History Survey, Urbana, Ill.

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Extensive collections of material from Mexico and smaller collections from other parts of Central and South America have brought to light several species of the genus *Helicopsyche* which prove to be new to science and are herein described.

The genus *Helicopsyche* is of unusual interest because the larva makes a coiled sand-grain case resembling a snail shell, and these queer cases have aroused the interest of many entomologists. A considerable number of species have been described from various parts of the world, including the West Indies and the Americas, but a moderate number of these descriptions are based only on larvae or females, for which forms we do not yet know adequate specific characters to allow positive identification of material.

The American species show a number of phylogenetic trends which are well marked. All these species have a mesobasal lobe or shoulder on the male clasper. In one evolutionary line this shoulder has become separated from the body of the clasper by a wide, arcuate incision (Figs. 5, 6) and has culminated in the species *incisa* and *quadrosa*. In the other well-marked evolutionary line, the mesobasal lobe first became cushion-like, as in Fig. 8, then developed into a wide process appearing to arise from the extreme base of the clasper, as in Figs. 9 and 10. Accompanying this change of the mesobasal lobe, the apical margin of the clasper became rounded and its posterodorsal portion became expanded to form a curious boomerang-shaped structure (Fig. 10). Successive stages in this line are illustrated by *planata*, *borcalis*, and *selanderi*, and the present known culminating species are *vergelana* and *piroa*.

It is a curious fact that all the Old World

species also have a mesal process arising from the basal edge of the clasper. The initial inference suggests that these Old World species arose from a form such as *vergelana*. In the Old World species, however, the wing venation is more primitive than in the American forms, and the shape of the body of the claspers suggests that they also arose from a type having claspers more like those found in *extensa* or *dampfi*, as apparently the specialized American forms did also. On this basis there seems no doubt that the New World and Old World forms of the genus represent two separate phylogenetic groups, and that the common ancestor of the two combined the more primitive venation of the Old World forms with a primitive clasper perhaps much like that found in some of the New World forms.

DESCRIPTION OF NEW SPECIES

The species described below are virtually identical in size, color, and general structure, as follows: Length from front of head to tip of folded wings, 6–8 mm; color various shades of medium brown except for the antennae and legs which are chiefly straw colored; sixth sternite of the male bearing a fingerlike process; third, fourth, and fifth sternites of both males and females with a fenestrated network of sclerotized thickenings.

Material treated in this paper is in the collection of the Illinois Natural History Survey, unless otherwise indicated.

Helicopsyche extensa, n. sp.

Male: Genitalia as in Fig. 1. Lateral aspect of ninth segment with moderately wide ventral edge; cercus attached just above lateral apodeme. Tenth tergite moderately long and curved downward apex. Clasper with lateral aspect elongated, bearing a truncate dorsal projection toward the base, and with the apical portion truncate; ventral aspect having a wide mesobasal shoulder at base, the mesal edge of the shoulder bearing

¹ This paper is a joint contribution from the Section of Faunistic Surveys and Insect Identification, Natural History Survey, and the Department of Entomology, University of Illinois.

three straight spines; apical portion beyond shoulder narrow.

Holotype male.—Santa Isabel, Valley of the Cosnipata, Department of Cusco, Peru, December 1951, Felix Woytkowski. *Paratype*.—Same data, 1 female.

***Helicopsyche woytkowskii*, n. sp.**

Male: Genitalia as in Fig. 2. Ninth segment with fairly long ventral margin; cercus attached a short distance above lateral apodeme. Tenth tergite moderately short, with a depression at its base. Claspers with lateral aspect short and regular, with relatively sharp anterodorsal and posterodorsal angles; ventral aspect with the fairly large mesobasal shoulder occupying nearly half the length of the clasper and bearing an irregular row of 5 or 6 stout setae along its mesal edge.

Holotype male.—Santa Isabel, Valley of the Cosnipata, Department of Cusco, Peru, January 9, 1952, Felix Woytkowski. *Paratype*.—Same data but December 19, 26, 1951, and January 1, 1952, 3 females.

The short, regular clasper, combined with the simple mesobasal shoulder will differentiate this species from other described species of the genus.

***Helicopsyche dampfi*, n. sp.**

Male: Genitalia as in Fig. 3. Ninth segment with fairly long ventral margin; cercus attached slightly above lateral apodeme. Tenth tergite long, fairly straight, and tapering to a point at apex. Clasper with lateral aspect moderately long and somewhat rectangular; the anterodorsal corner is produced into a short truncate process, the posterodorsal corner is produced into a moderately sharp point; in ventral aspect, the mesobasal shoulder is relatively large and wide, with a row of stout bristles; from this view the apical portion of the clasper is fairly long, with the dorsal portion curved mesad.

Holotype male.—Finca Germania, Chiapas, Mexico, June 20, 1935, A. Dampf. *Paratype*.—Yepocapa, Mun. Yepocapa, Chimaltenango, Guatemala, April 27, 1948. Elev. 4,800 feet. R. L. Wenzel, 1 female (in the collection of the Chicago Natural History Museum).

Distinctive features of this species are the shape of the apex of the clasper and the broad mesobasal lobe with its cushion of setae.

***Helicopsyche truncata*, n. sp.**

Male: Genitalia as in Fig. 4. Ninth segment

with moderately long ventral margin, the cercus inserted very close to lateral apodeme. Tenth tergite short and blunt at apex. Lateral aspect of clasper irregular; anterodorsal corner rounded, posterodorsal corner almost quadrate; ventral margin with the mesobasal lobe projecting as a large triangular process. Ventral view of clasper with basal process appearing narrow but sharp, with an irregular mesal cushion of spines.

Holotype male.—Finca Vergel, Chiapas, Mexico, May 19, 1935, A. Dampf. *Paratypes*.—Same data but May 23, 1 male; same data but May 28, 1 male; Huehuetan, Chiapas, November 9, 1932, A. Dampf, 1 male; Mexico, without definite locality, 8 males.

This species is distinguished from other members of the genus by the triangular and shoulder-like mesobasal lobe, as seen in lateral view.

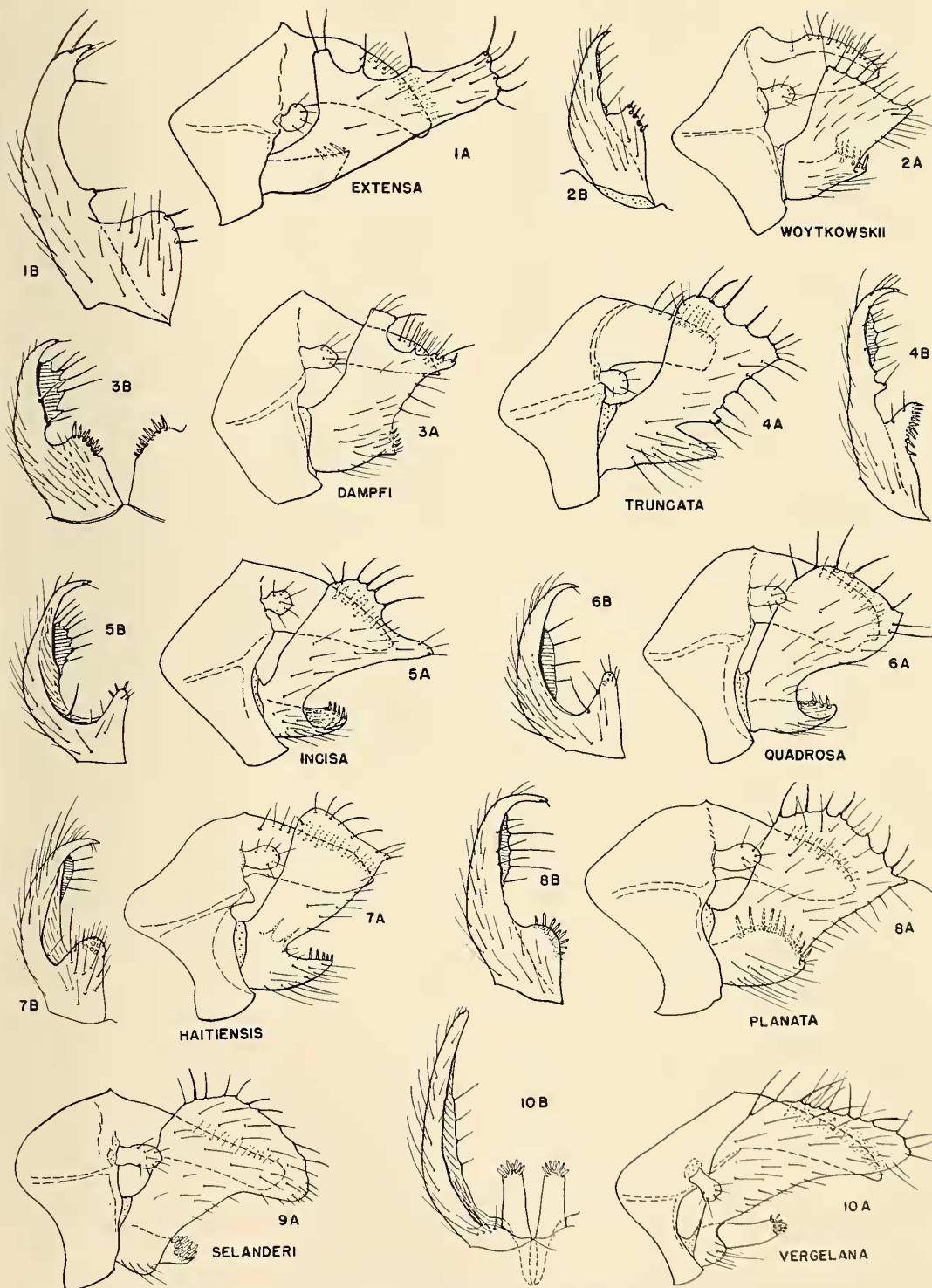
***Helicopsyche incisa*, n. sp.**

Male: Genitalia as in Fig. 5. Ninth segment with moderately long ventral margin, the cercus situated a considerable distance above the lateral apodeme. Tenth tergite of moderate length and sloping gradually to apex. Clasper deeply incised toward the base in such a way that the mesobasal lobe is a narrow mesal projection separated from the main part of the clasper by a wide, arcuate incision; lateral aspect of clasper narrowed above mesobasal lobe, dorsal portion expanded, its anterodorsal corner large and rounded, its posterodorsal corner narrow, elongate and sharp; mesobasal lobe of clasper with a small cushion of short teeth.

Holotype male.—Finca Esperanza, Chiapas, Mexico, May 2, 1938, A. Dampf. *Paratypes*.—Same data but April 4 and April 12, 2 males, and May 30, 1 male; Finca Vergel, Chiapas, May 19–31, 1935, A. Dampf, 7 males; Finca Victoria, Chiapas, May 15, 1938, A. Dampf, 1 male; Mexico (no definite locality), 1 male.

This species forms a small complex with the next (*quadrosa*), the two differing from other members of the genus in having the arcuate incision between the mesobasal lobe of the clasper and the main body of the clasper. In *incisa* the apical margin of the clasper has an excavated area between the two corners, whereas in *quadrosa* the apical margin is evenly rounded.

Both *incisa* and *quadrosa* are probably most closely related to *haitiensis* Banks (Fig. 7), which differs from the two Mexican species in having a narrower but sharper incision between the mesobasal lobe and the body of the clasper. There is



FIGS. 1-10.—Male genitalia of *Helicopsyche*: A, Lateral aspect; B, ventral aspect of left clasper. All but Fig. 7 drawn from the holotypes.

every indication that *haitiensis* represents a form ancestral to the two Mexican species.

***Helicopsyche quadrosa*, n. sp.**

Male: Genitalia as in Fig. 6. Lateral view of ninth segment with ventral margin moderately short, and with the cercus inserted considerably above the lateral apodeme. Tenth tergite fairly deep. Clasper with mesobasal process long and narrow, separated from body of clasper by an arcuate incision; lateral view of clasper constricted above meso-basal lobe, the dorsal portion expanding rapidly, with a rounded anterodorsal corner, a quadrate and relatively massive posterodorsal corner, and an even apical margin.

Holotype male.—Finca Victoria, Chiapas, Mexico, June 1, 1935, A. Dampf. *Paratypes*.—Same data but June 2, 1 male; Finca Vergel, Chiapas, May 28, 1935, A. Dampf, 1 male.

This species is most closely related to *incisa*, differing in the shape of the clasper as described under the preceding species.

***Helicopsyche planata*, n. sp.**

Male: Genitalia as in Fig. 8. Lateral aspect of ninth segment with fairly wide ventral margin and with the cercus situated a short distance above the lateral apodeme. Tenth tergite fairly long and moderately deep. Clasper with lateral aspect somewhat rectangular, its apical portion moderately expanded, the anterodorsal corner rounded, the posterodorsal corner pointed but not greatly produced; in ventral view the mesobasal lobe forms a rounded shoulder bearing a cluster of spines.

Holotype male.—San Cristóbal, Chiapas, Mexico, July 7, 1926, A. Dampf. *Paratype*.—Same data, 1 male.

This species is most closely related to *borealis* (Hagen) on one hand and the *mexicana-arizonensis-limnella* complex on the other. From *borealis*, *planata* differs in the sharp posterodorsal corner of the clasper, the less bowed dorsal margin of the clasper, and in the short aedeagus, which in *planata* is one and a half times the length of the tenth tergite and in *borealis* about twice the length of the tenth tergite. From *mexicana* and its allies *planata* differs in the narrower apex and the regularly rounded anterodorsal corner of the clasper.

***Helicopsyche selanderi*, n. sp.**

Male: Genitalia as in Fig. 9. Lateral aspect of

ninth segment with fairly wide ventral margin, and with the cercus attached just above the lateral apodeme. Tenth tergite elongate and relatively shallow. Lateral aspect of main body of clasper fairly narrow and angular at the base, tapering toward apex, the apical portion itself greatly enlarged and forming a large, rounded posteroapical expansion; the anterodorsal corner is evenly rounded; the mesobasal lobe forms a tubular process which in ventral view is about the same width and about half the length of those shown in Fig. 10B, capped with the same cluster of spines.

Holotype male.—20 miles west of Morelia, Michoacán, Mexico, July 19, 1955, R. B. and J. M. Selander. *Paratype*.—Same data, 1 male.

This species forms an interesting annectant step between *borealis* and the *piroa* complex. From *borealis* it differs in the produced posterodorsal area of the clasper and in the well differentiated mesobasal lobe. From the *piroa* complex, *selanderi* differs in the wider basal portion and shorter posterodorsal area of the clasper.

***Helicopsyche vergelana*, n. sp.**

Male: Genitalia as in Fig. 10. Lateral aspect of ninth segment with the ventral portion unusually narrow and small, and with the cercus attached a short distance above the lateral apodeme. Tenth tergite moderately long and moderately shallow. Main body of clasper with lateral aspect small and narrow at base, expanding toward apex into a greatly developed posterodorsal lobe; mesobasal lobe forming a long flat process, in ventral view appearing to rise from the extreme mesal corner of the base of the clasper; each lobe is capped with a cluster of spines. In the holotype this process is as long as in Fig. 10; in some of the paratypes it ranges to only two-thirds this length.

Holotype male.—Finca Vergel, Chiapas, Mexico, May 30, 1935, A. Dampf. *Paratypes*.—Huehuetan, Chiapas, Mexico, November 9, 1932, A. Dampf, 1 male; Chipitlan, Cuernavaca, Mexico, May 3, 1941, A. Dampf, 1 male; Rancho Monter, Oaxaca, Mexico, Dec. 14, 1937, A. Dampf, 1 male; Hacienda Vista Hermosa, Villa Santiago, Nuevo León, Mexico, June 16, 1940, Hoogstraal and Knight, 5 males, 3 females; Sabinas Hidalgo, Nuevo León, Mexico, June 16, 1939, H. Hoogstraal, 4 males, 2 females. Additional larvae and pupae were collected by Harry Hoogstraal on rocks in a spring at the last locality.

This species is most closely related to *piroa* Ross, from which it differs in the typical narrow process of the sixth sternite, the shallow tenth tergite and the narrower and usually more elongate mesobasal process of the clasper. In *piroa* the ventral process of the sixth sternite is wide and flat, forming a broad flap; the tenth tergite is deep and bears a ridged hump at the base; and the mesobasal process is only slightly

longer than that in *selanderi*, but much wider than in *vergelana*.

The above material from the vicinity of Nuevo León was previously considered as belonging to *piroa* and was included in the original description of that species. More critical examination of differences instigated by the discovery of *selanderi* has led to a more critical diagnosis of these forms.

SMALL ARMS AND AMMUNITION

The American Revolution might have been fought—on the side of the colonies—with bows and arrows. They still were better weapons, in some respects, than the available muskets of the day—as emphasized by Benjamin Franklin in a 1776 letter to Gen. Charles Lee, who then was engaged in fortifying the port of New York:

These were good weapons, not lightly laid aside: Because a man may shoot as truly with a bow as with a common musket. He can discharge four arrows in the time of charging and discharging one bullet. His object is not taken from his view by the smoke of his own side. A flight of arrows, seen coming upon them, terrifies and disturbs the enemies' attention to their business. An arrow striking in any part of a man puts him hors-du-combat till it is extracted. Bows and arrows are more easily provided everywhere than muskets and ammunition.

This is cited by Col. Berkeley R. Lewis, of the Frankfort Arsenal, Philadelphia, in a comprehensive treatise¹ on small arms and ammunition, especially as used in the United States military service, which has just been published by the Smithsonian Institution.

There was a good deal to be said for Franklin's position for, after more than four centuries, firearms still were in a rather primitive stage and, even such as they were, the colonies were poorly equipped to produce them. Just when firearms first were used in battle is somewhat debatable, Colonel Lewis points out. Artillery was used first. Some cannon were made in Italy around 1312. They were stone-throwing mortars.

The first hand firearms were crude iron or copper tubes, fired by applying a live coal to a touchhole. This was a shallow cup at the top of

the breech, whence a small hole led downward into the powder chamber. This device usually—not always—fired the charge.

Most of the trouble with firearms during the succeeding 500 years was due to this ignition system. All this time at least one misfire could be expected in ten shots.

The first pistols, known as "bombardelles," appeared in Italy about the middle of the fourteenth century. The barrels were 9 inches long. In 1544 French cavalry were armed with "pistols" whose barrels were 25 inches long.

Hand cannon were brought to England in 1471. This weapon, weighing between 60 and 70 pounds, was carried by two men. It was difficult to load and uncertain in range and accuracy—quite inferior to the crossbow or longbow then still in use.

Early in the fifteenth century Spaniards invented the arquebus with a matchlock trigger mechanism. It was probably inferior to the longbow in battle. About 1521 Spanish inventors produced the "mousquet," musket. It was 6 to 7 feet long, weighed 60 to 70 pounds, and was very slow in loading. The oldest rifles date from the end of the fifteenth century. At first they were considered purely as sporting weapons.

When the first settlers came to North America they brought with them the firearms then in use in Europe. There were local gunsmiths, but most of them were engaged in repair of arms, and rebuilding of weapons damaged beyond repair, by combining parts of two or more. At the start of the Revolution the only military arms of any consequence in the hands of the colonists were the European weapons left over from the French and Indian wars. During the war anything that would shoot was pressed into service. Small local manufactures were expanded, however, and new ones started under patronage of the various colonies.

From this point Colonel Lewis traces the evolution of small arms through the various American wars up through the Civil War.

¹ *Small arms and ammunition in the United States Service* [1776-1865], by Col. BERKELEY R. LEWIS, 338 pp., 52 pls. Smithsonian Institution, Washington 25, D. C. \$8.00.